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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/724,015

11/26/2003

Alexei A. Erchak

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11/30/2006

WOLF GREENFIELD & SACKS, PC  
FEDERAL RESERVE PLAZA  
600 ATLANTIC AVENUE  
BOSTON, MA 02210-2206

EXAMINER

HODGES, MATTHEW P

ART UNIT

PAPER NUMBER

2879

DATE MAILED: 11/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/724,015

Applicant(s)

ERCHAK, ALEXEI A.

Examiner

Matt P. Hodges

Art Unit

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 27-54, 56, 60 and 63-102 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27-54, 60 and 65 is/are allowed.
- 6) ☒ Claim(s) 56, 63, 66, 68-75, 77-82, 84, 86-91, 93, 94 and 96-102 is/are rejected.
- 7) ☒ Claim(s) 64, 67, 76, 83, 85, 92 and 95 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 February 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 9/1/2006.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Amendment***

The Amendment, filed on 9/13/2006, has been entered and acknowledged by the Examiner.

### ***Terminal Disclaimer***

The terminal disclaimers filed on 9/13/2006 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration dates of 7,084,434, 10/729,029, and 6,831,302 has been reviewed and is accepted. The terminal disclaimer has been recorded.

### ***Information Disclosure Statement***

As discussed with applicant, a previous filed IDS included a typographical error and thus a reference was not considered. This reference, 5,779,924, is included with this action to indicate its consideration by the examiner at this time.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 56, 63, 66, 68, 70-74, 93, 94, 96, and 98-102 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi (US 5,181,220).

Regarding claims 56, 63, 70, 73, and 74, Yagi discloses (see figure 2) an LED including a multi-layer stack of semiconductor materials further including a light generating region (5) and a first layer (14) supported by the light generating region. The first layer is composed of a semiconductor material including a non-periodic pattern of holes which serve to collimate or focus the light emitted by the active region. (Column 3 lines 35-45). Further, the device emits substantially incoherent light. Yagi does not appear to specify the inclusion of the side dimension of 1mm and for the recitation of the extraction efficiency being independent of the edge length. However extraction efficiency is a product of wave-guide modes, and as such is dependent on the structure of the emitting face. In this case, the pattern of holes or rings would eliminate edge to extraction efficiency dependencies. Further the varying of the edge size is well understood in the art of LED devices. Devices are made longer to increase brightness while they are shortened to increase yield and reduce manufacturing cost. The changing of a device size, when the device size is known to be altered, is then not considered novel if the claimed components of the device serve functions independent of the device size and are thus not affected by changing the device size. The use of semiconductor gratings as disclosed above is not dependant upon the length of the device, as they are not of a specific number and would be included to fill the space with an established formulaic pattern. As such, their operation and function are independent of the length of the device. Thus, it would have been obvious at the time the invention was made to a person having ordinary skills in the art to incorporate the inclusion of the side dimension of 1mm into the device as disclosed by Yagi since such a change in device size does not alter the material functionality of the disclosed device.

Regarding claim 66, the pattern is formed of a bunch of holes. (See figure 2)

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Regarding claim 68, claim 68 is rejected for the same reasons as is specified in the rejection of claim 56 above.

Regarding claim 71, Yagi discloses the device as claimed, and further specifies that the first layer is a p-doped semiconductor while the device further includes an n-doped semiconductor. However, it is common in semiconductor devices to alternate the n and p-doped layers without significantly changing the device operation depending on usage and charge profile. Thus, it would have been obvious at the time the invention was made to a person having ordinary skills in the art to alternate the use of n and p doped materials for the first layer and inside the device into the device as disclosed by Yagi since such a change in device layer ordering does not alter the material functionality of the disclosed device and amounts to a mere design choice.

Regarding claim 72, the holes only extend through the first layer and do not extend into the light-emitting region. (See figure 2).

Regarding claim 93, claim 93 is rejected for the same reasons as specified in the rejection of claim 56 above. Further, there is not a reflective layer between the light emitting region and the first layer.

Regarding claim 94, claim 94 is rejected for the same reasons as specified in the rejection of claim 66 above.

Regarding claim 96, claim 96 is rejected for the same reasons as specified in the rejection of claim 68 above.

Regarding claim 98, claim 98 is rejected for the same reasons as specified in the rejection of claim 70 above.

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Regarding claim 99, claim 99 is rejected for the same reasons as specified in the rejection of claim 71 above.

Regarding claim 100, claim 100 is rejected for the same reasons as specified in the rejection of claim 72 above.

Regarding claim 101, claim 101 is rejected for the same reasons as specified in the rejection of claim 73 above.

Regarding claim 102, claim 102 is rejected for the same reasons as specified in the rejection of claim 74 above.

Claims 56, 63, 66, 68-73, 75, 77-82, 84, 86-91, 93, 94, and 96-101 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergh et al. (US 3,739,217).

Regarding claims 56, 63, 70, and 73, Bergh discloses (see figure 1) an LED including a multi-layer stack of semiconductor materials further including a light generating region (below 11) and a first layer (above 11) supported by the light generating region. The first layer is composed of a semiconductor material including a non-periodic pattern of holes which serve to eliminate waveguide modes and direct light out of the surface of the first layer. (Column 2 lines 35-50). Further, the device emits substantially incoherent light. Bergh does not appear to specify the inclusion of the side dimension of 1mm and for the recitation of the extraction efficiency being independent of the edge length. However extraction efficiency is a product of wave-guide modes, and as such is dependent on the structure of the emitting face. In this case, the pattern of holes would eliminate edge to extraction efficiency dependencies. Further the varying of the edge size is well understood in the art of LED devices. Devices are made longer

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to increase brightness while they are shortened to increase yield and reduce manufacturing cost. The changing of a device size, when the device size is known to be altered, is then not considered novel if the claimed components of the device serve functions independent of the device size and are thus not affected by changing the device size. The use of the roughened semiconductor as disclosed above is not dependant upon the length of the device, as it is designed to negate length effects of the device. As such, its operation and function is independent of the length of the device. Thus, it would have been obvious at the time the invention was made to a person having ordinary skills in the art to incorporate the inclusion of the side dimension of 1mm into the device as disclosed by Bergh since such a change in device size does not alter the material functionality of the disclosed device.

Regarding claim 66, the pattern is formed of a bunch of holes. (See figure 1)

Regarding claim 68, claim 68 is rejected for the same reasons as is specified in the rejection of claim 56 above.

Regarding claim 69, the device as disclosed by Bergh further includes an opaque surface of on the bottom of the device. In this instance, all light transmitted from the device is either transmitted from the surface of the first layer or through the side of the device. However, in order for light to be transmitted from the side of the device, it must travel the length of the device in waveguide modes. This is substantially impossible with the roughened surface disclosed. As such, substantially all emitted light would be emitted from the front of the first surface.

Regarding claim 71, Bergh discloses the device as claimed, and further specifies that one of the layers is a p-doped semiconductor while the device further includes a second layer that is an n-doped semiconductor. However, it is common in semiconductor devices to alternate the n

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and p-doped layers without significantly changing the device operation depending on usage and charge profile. Thus, it would have been obvious at the time the invention was made to a person having ordinary skills in the art to alternate the use of n and p doped materials for the first layer and inside the device into the device as disclosed by Bergh since such a change in device layer ordering does not alter the material functionality of the disclosed device and amounts to a mere design choice.

Regarding claim 72, the holes only extend through the first layer and do not extend into the light-emitting region. (See figure 1).

Regarding claim 75, claim 75 is rejected for the same reasons as specified in the rejection of claim 56 above. Further, the roughened surface is comprised of holes devoid of material.

Regarding claim 84, claim 84 is rejected for the same reasons as specified in the rejection of claim 56 above. Further, the roughened surface is comprised of non-concentric holes.

Regarding claim 93, claim 93 is rejected for the same reasons as specified in the rejection of claim 56 above. Further, there is not a reflective layer between the light emitting region and the first layer.

Regarding claim 94, claim 94 is rejected for the same reasons as specified in the rejection of claim 66 above.

Regarding claims 77, 86, and 96, ~~claims 77, 86, and 96~~ are rejected for the same reasons as specified in the rejection of claim 68 above.

Regarding claims 78, 87, and 97, ~~claims 77, 86, and 96~~ are rejected for the same reasons as specified in the rejection of claim 69 above.



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Regarding claims 79, 88, and 98, claims ~~77, 86, and 96~~ are rejected for the same reasons as specified in the rejection of claim 70 above.

Regarding claims 80, 89, and 99, claims ~~77, 86, and 96~~ are rejected for the same reasons as specified in the rejection of claim 71 above.

Regarding claims 81, 90, and 100, claims ~~77, 86, and 96~~ are rejected for the same reasons as specified in the rejection of claim 72 above.

Regarding claims 82, 91, and 101, claims ~~77, 86, and 96~~ are rejected for the same reasons as specified in the rejection of claim 73 above.

***Allowable Subject Matter***

Claims 27-54, 60, and 65 are allowed.

Claims 64, 67, 76, 83, 85, 92, and 95 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claim 27, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 27, and specifically comprising the limitation of a light emitting device where the extraction efficiency is independent the length of the device and a first surface of the device includes a pattern of holes with an ideal lattice constant and a detuning parameter greater than zero.

Regarding claims 28-54, 60, and 65, claims 28-54, 60, and 65 are allowable for the same reasons given in claim 27.

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Regarding claim 64, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 64, and specifically comprising the limitation of a light emitting device where the extraction efficiency is independent the length of the device and a first surface of the device includes a pattern of holes with a quasicrystalline pattern.

Regarding claim 67, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 67, and specifically comprising the limitation of a light emitting device where the extraction efficiency is independent the length of the device and a first surface of the device includes a pattern of holes where the cross sectional dimension of the holes is less than 190 nanometers.

Claims 76, 85, and 94 are allowed for the same reason as stated for claim 67 above.

Regarding claim 83, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 83, and specifically comprising the limitation of a light emitting device where the extraction efficiency is independent the length of the device and a first surface of the device includes a pattern of holes where the emitted light is collimated more than a Lambertian distribution of light.

Claim 92 is allowed for the same reason as stated for claim 83 above.

### ***Response to Arguments***

Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

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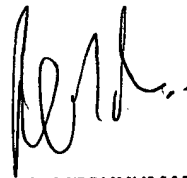
***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matt P Hodges whose telephone number is (571) 272-2454. The examiner can normally be reached on 7:30 AM to 4:00 PM M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

mph



**NIMESHKUMAR D. PATEL  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800**